

COMMITTEE ON SCIENCE
SUBCOMMITTEE ON ENVIRONMENT, TECHNOLOGY, AND STANDARDS
U.S. HOUSE OF REPRESENTATIVES

HEARING CHARTER

NOAA Satellites: Will Weather Forecasting Be Put at Risk?

Tuesday July 15, 2003

2:00 p.m. to 4:00 p.m.

2318 Rayburn House Office Building

Purpose:

On Tuesday July 15, 2003 at 2:00 p.m., the House Science Committee's Subcommittee on Environment, Technology and Standards will hold a hearing to examine satellite programs at the National Oceanic and Atmospheric Administration (NOAA). NOAA procures and operates the nation's environmental monitoring satellites, which provide raw data and processed data products to the National Weather Service (NWS), the Department of Defense (DOD), and the public for weather forecasting and prediction. NOAA performs these duties through its line office, the National Environmental Satellite, Data, and Information Service (NESDIS). NOAA is in the final preparation stages (and has awarded the prime contract) for the new National Polar-orbiting Operational Environmental Satellite System (NPOESS), which has a lifetime (23 years) cost of \$6.5 billion. While NOAA is the lead agency, NPOESS is a tri-agency effort among NOAA, the National Aeronautics and Space Administration (NASA), and DOD to combine and integrate the polar satellite needs and capabilities of all three agencies. The procurement cost is shared equally between NOAA and DOD. Given the tremendous cost and important mission of NOAA's environmental satellites, the Subcommittee will be providing continuous oversight of this project.

The hearing will focus on these major concerns:

- (1) The Administration's Fiscal Year (FY) 2004 budget request significantly delays when the first NPOESS satellite would be ready. This could create a 21-month gap in polar satellite coverage if the last satellite from the current NOAA polar series fails during launch or in orbit. A loss of polar satellite coverage could severely compromise three to seven day weather forecasts, prediction of severe weather events, such as hurricanes, and daily aviation operations.
- (2) The Committee is concerned about possible cost increases in the development of NPOESS. Given the current budget climate, this could cause even further delays in availability of this new polar satellite program and possibly lead to a decision to drop some instruments from the satellites.
- (3) Given the advanced untested technology, the new satellite's sensors and ground systems may have unforeseen technical difficulties, which could lead to further delay. NOAA may not be paying enough attention to this possibility.
- (4) DOD may be withdrawing some of its funding support for NPOESS, because DOD's current weather satellites may last longer than originally anticipated. This is critical because NPOESS funding is equally shared between DOD and NOAA.

The Subcommittee plans to explore several overarching questions, including:

1. The Administration's FY 2004 budget request creates a 21-month gap between the launching of the last satellite from the current NOAA polar program (Polar-orbiting Operational Environmental Satellite or POES) and when the first NPOESS would be ready, but NOAA's internal satellite coverage policy states that such a gap is unacceptable. Why is NOAA willing to accept this potential loss of coverage?
2. If the last POES satellite fails, to what extent would three to seven day weather forecasts and prediction of severe weather such as hurricanes be compromised? What would be the specific ramifications of a loss of polar satellite coverage? Do NOAA and DOD have a contingency plan for this potential predicament?
3. What are NOAA and DOD doing to ensure the NPOESS program stays on budget and that the advanced technology requirements for satellite capabilities will be met?
4. Is DOD fully committed to the NPOESS procurement schedule?

Witnesses:

Mr. Gregory Withee, Assistant Administrator for National Environmental Satellite, Data, and Information Service (NESDIS), National Oceanic and Atmospheric Administration (NOAA).

Mr. Withee represents the office responsible for carrying out NOAA's NPOESS obligations.

Mr. Peter Teets, Undersecretary of the Air Force and Department of Defense Executive Agent for Space. Mr. Teets is responsible for developing, coordinating and integrating plans and programs for space systems and the acquisition of DOD space defense acquisition programs.

Mr. David Powner, Acting Director Information Technology Management Issues, General Accounting Office. GAO has been following the development of NPOESS and is prepared to discuss its concerns with the program.

Mr. Wes Smith, President, Northrop Grumman Space Technology. Mr. Smith has general management responsibility for space technology businesses at Northrop Grumman, the prime contractor for NPOESS.

Dr. Ronald McPherson, Executive Director, American Meteorological Society. Prior to joining AMS, Dr. McPherson was director of the National Weather Service's National Centers for Environmental Prediction (NCEP).

Summary of Issues

The Administration's Fiscal Year (FY) 2004 budget creates a potential 21-month loss of polar satellite coverage if the last POES satellite fails during launch or in orbit. This is against NOAA's internal satellite risk policy, and NOAA apparently has no contingency plan for this potential problem. The December 2002 plan for NPOESS called for the first satellite to be ready by 2008. Based on the Administration's FY04 budget request, the first satellite will not be ready until 2010 or 2011. Why is this acceptable? According to NOAA there is a 4 to 10 percent chance of launch failure and a 4 percent chance of failure in orbit for satellites. Thus, there is a real possibility that the last POES satellite could fail. This situation actually happened in the early 1990s when NOAA's geostationary satellite program had a satellite fail in orbit, and there was a delay in the availability of the new satellite to replace it. Additionally, at that time, the one geostationary satellite remaining in orbit faced a real danger of

orbital failure. The current budget situation with NPOESS could easily precipitate a similar situation.

A loss of polar satellite coverage could severely compromise three to seven day weather forecasts and prediction of severe weather events, such as hurricanes. Industries as varied as aviation, agriculture, construction, emergency management, and climate research would be drastically affected by such a loss. In aviation, three to seven day weather forecasts are vital for planning flight paths to avoid major storm systems or volcanic ash. For emergency managers, more accurate forecasts of the paths of events like hurricanes can save millions of dollars, because it can cost up to \$1 million a mile to evacuate a coastal community for a hurricane. Finally, polar satellites provide long-term climate records vital for validating global climate models and providing seasonal forecasts for industries such as energy distribution and agriculture.

Given the untested technology, the new satellite's sensors and ground systems may have unforeseen technical difficulties and potential cost overruns. The last major satellite acquisition program at NOAA, GOES-NEXT, was \$1.4 billion over budget and five years behind schedule due to a lack of technical planning and program development delays similar to those that NPOESS is experiencing now. Also, while NPOESS has general risk reduction included in the program plan, it appears that NOAA has not prioritized these risks or made available its specific risk reduction plans for each risk. For example, the largest risk reduction part of NPOESS, a joint program with NASA, has already been delayed by six months. This program not only provides a platform for testing some of the new sensors that will be part of NPOESS, but also is a link between the last experimental earth-observing satellite from NASA and the first NPOESS. If it is delayed any further, the continuity of climate data from these new sensors could be compromised. It is not clear how NOAA is addressing these concerns.

In December 2002, the contractor for NPOESS (Northrop Grumman) completed a detailed program plan, but when the Administration's FY04 budget request was released in February 2003, the total FY04-2007 NPOESS funding was reduced by \$130 million. This early funding reduction has forced Northrop Grumman to reformulate the program plan. Since satellite acquisition programs consist of three components - funding, equipment requirements, and schedule - if one component changes, another must be adjusted to compensate. For example, if funding decreases, the schedule must be delayed or the equipment requirements must be reduced. Currently the FY04-adjusted NPOESS program plan only incorporates schedule delays, but if future funding levels continue to drop, then at some point satellite capabilities may be compromised. By constantly readjusting the program schedule, our ability to test all of the components of the satellite system (satellite platform, sensors and ground systems) at the appropriate time is sacrificed. This makes the overall development of NPOESS less efficient than originally planned and could create unforeseen technical difficulties and cost overruns.

DOD may be withdrawing some of its funding support for NPOESS, because DOD's current weather satellites may last longer than originally anticipated. NPOESS is a tri-agency effort between NOAA, NASA, and the Department of Defense to combine and integrate the polar satellite needs and capabilities of all three agencies. The procurement cost is shared equally between NOAA and DOD. Currently, NOAA has its POES satellites and DOD uses its

Defense Meteorological Satellite Program (DMSP) satellites for polar satellite coverage. However, loss of the polar-satellite coverage that POES provides will not only affect the civilian sector, but also the military. DOD relies heavily on NOAA POES satellites for some of its operations. In the recent war in Iraq, the Air Force used data from POES for planning operations and the Navy routinely using POES data for its ship routing. Since NPOESS funding is equally shared between NOAA and DOD, it is vital DOD maintain its financial commitment to the program.

Background

What is NESDIS?

The National Environmental Satellite, Data, and Information Service (NESDIS) acquires and operates NOAA's satellites and manages the processing, distribution, and archiving of their data and other environmental data through its National Data Centers. NOAA satellites are used for "operational" purposes, mostly for providing real-time data and products to the National Weather Service (NWS) and DOD, whereas NASA satellites are used mostly for research purposes. NOAA's mission requires at least two geostationary and two polar-orbiting satellites to be deployed in orbit at the same time to ensure full coverage. NESDIS also operates three National Data Centers, which together are the largest collection of atmospheric, geophysical, and oceanographic data in the world.

The FY04 budget request for NESDIS is \$838 million of which \$150 million is for regular operations, research and facilities and \$687 million is for procurement, acquisition and construction of satellites. In FY03 NESDIS received \$710 million of which \$151 million was for regular operations, research and facilities and \$559 million was for procurement, acquisition and construction of satellites.

What is NPOESS?

The National Polar-orbiting Operational Environmental Satellite System (NPOESS) is a tri-agency effort between NOAA, NASA, and DOD to combine and integrate the polar satellite needs and capabilities of all three agencies. As with NOAA, DOD currently operates two polar-orbiting satellites mostly for weather forecasting. NPOESS will replace the four NOAA/DOD satellites with three that the agencies will share at a total cost of \$6.5 billion, split evenly between NOAA and DOD. The estimated savings from this collaboration is \$1.8 billion.

NOAA has a policy that a backup satellite must be available at the time a new polar satellite is launched. Therefore, the first NPOESS satellite must be ready by 2008, to cover the possible launch failure of the last of the older generation of polar satellites. But, now it is more likely that the first NPOESS satellite will not be ready until 2010. This program is a significant portion of NOAA's overall budget, greater than the agency spends on all its oceans and atmospheric research.

NASA is providing technical help and was scheduled to fly many of the NPOESS sensors on a NASA satellite or airplane starting in 2005 to ensure the sensors work, and to allow NOAA time to view the data to ensure it can be incorporated into its models and made into products.

However, that schedule is now delayed six months and it is uncertain how this will affect the overall NPOESS program.

From 2002 Federal agency NPOESS planning documents, the NOAA/DOD FY04 request for NPOESS was expected to be \$608 million and remain at that level for several years before declining. However, the FY04 requests for NPOESS is only \$554 million total. This decrease delays the availability of the first NPOESS satellite and creates a potential loss of polar satellite coverage if the last POES satellite fails during launch.

What happened in the early 1990's with GOES-NEXT?

There are concerns about these early funding decreases and delays in NPOESS primarily because of major problems with the last upgraded satellite procurement at NOAA, GOES-NEXT. In the end this program was \$1.4 billion over budget and five years late in launch availability. Due to a series of events, this delay meant that from 1989 through 1992, NWS was forced to rely on only one GOES satellite, when normally it uses two GOES satellites. This meant that satellite coverage over the Pacific and Atlantic Ocean was compromised for that time. In addition, the one satellite that remained was nearing the end of its expected lifetime and it was a member of a series of satellites that had experienced extensive technical difficulties and operational failures. Had that satellite failed, the NWS would have been unable track severe weather in real time or provide continuous weather images of the United States. After 1992 the NWS was able to use a satellite from Europe to restore dual geostationary coverage until GOES-NEXT was available in 1994. Delays in NPOESS could result in similar problems with future polar-satellite coverage. Given the complexity of our weather models today, it is uncertain whether the U.S. could use other nations' satellites for polar coverage in the future.

Questions for Witnesses

Mr. Gregory Withee

1. Why is the Administration's FY04 budget request for NPOESS \$70 million less than the level that was determined to be necessary at the Milestone Review of NPOESS by DOD, NOAA, and NASA in July 2002?
2. The Administration's FY 2004 budget request creates a 21-month gap between the launching of the last NOAA Polar-orbiting Operational Environmental Satellite (POES) and when the first National Polar-orbiting Operational Environmental Satellite System (NPOESS) satellite would be ready. If the last POES were to fail on launch, it would result in a loss of polar-satellite coverage. How would such a loss affect NOAA's ability to carry out its mission of providing weather and climate information to the nation? What options would be available to NOAA to mitigate those effects? What plan does NOAA have in place to deal with this contingency?
3. To what extent could the FY04 budget request result in a reduction in the types of sensors NPOESS will carry? If funding were further reduced, at what level of funding would you be forced to reduce sensor capabilities or requirements? How would this affect NOAA's ability to carry out its mission of providing weather and climate information to the nation?
4. Even if NPOESS operates as planned, how does NOAA plan to deal with the significant remaining technical challenges to ensure the NPOESS satellite data and data products can be properly maintained, archived, and distributed?

Mr. Peter Teets

1. The Administration's FY 2004 budget request creates a 21-month gap between the launching of the last NOAA Polar-orbiting Operational Environmental Satellite (POES) and when the first National Polar-orbiting Operational Environmental Satellite System (NPOESS) satellite would be ready. If the last POES were to fail on launch, it would result in a loss of polar-satellite coverage. How would such a loss affect DOD operations? What options would be available to DOD to mitigate those effects? What plan does DOD have in place to deal with this contingency?
2. To what extent could the FY04 budget request result in a reduction in the types of sensors NPOESS will carry? If funding were further reduced, at what level of funding would you be forced to reduce sensor capabilities or requirements? How would this affect DOD operations?
3. Even if NPOESS operates as planned, how does DOD plan to deal with the significant remaining technical challenges to ensure the NPOESS satellite data and data products can be properly maintained, archived, and distributed?
4. If the last Defense Meteorological Satellite Program (DMSP) satellite lasts longer than anticipated, will DOD remain fully committed to the current NPOESS procurement schedule?

Mr. David Powner

1. What major concerns has GAO uncovered as it follows the National Polar-orbiting Operational Environmental Satellite System (NPOESS) project? Specifically, do you see any possible cost overruns, schedule delays or technical difficulties with sensor or ground system software development in the near future? What are the implications of these potential problems and what would you suggest the National Oceanic and Atmospheric Administration (NOAA) and the Department of Defense (DOD) should do to address these issues?
2. Knowing that the last major satellite procurement program for Geostationary Operational Environmental Satellites (GOES) had technical difficulties that resulted in \$1.4 billion in cost-overruns and a 5 year delay, has NOAA adequately applied lessons learned from that incident to prevent similar problems with NPOESS and the next generation of GOES satellites?
3. If there is a loss of polar satellite coverage, can other satellites be moved in to accommodate the needs of the National Weather Service and DOD? What is the agency contingency plan for this potential loss of polar satellite coverage?

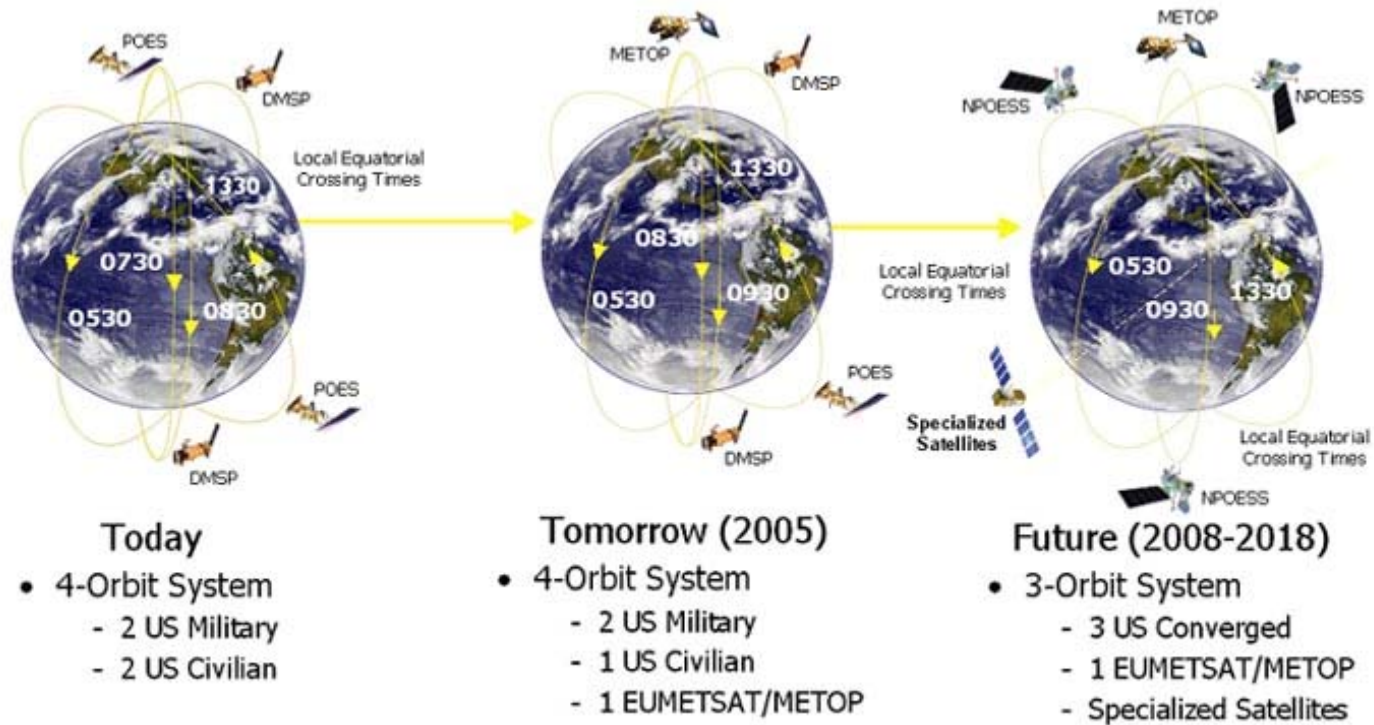
Mr. Wes Smith

1. How will the Administration's proposed funding decrease for the National Polar-orbiting Operational Environmental Satellite System (NPOESS), affect your ability to follow the schedule plan outlined in your contract?
2. What technical difficulties have you encountered and what challenges do you foresee in developing NPOESS, given that the sensors and ground systems for NPOESS are technologically advanced, new, and untested?
3. When will the new NPOESS program plan be ready? How will it address the proposed four-year \$130 million budget decrease?

Dr. Ronald McPherson

1. From 1989 through 1992, the National Weather Service was forced to rely on only one Geostationary Operational Environmental Satellite system (GOES) satellite, when normally it would use two operational GOES satellites. What events led to this precarious situation? What would have been the implications if the single GOES satellite had failed, resulting in a loss of geostationary satellite coverage?
2. Is the nation more dependent on satellite data for weather forecasting now than 10 years ago? Will our dependence continue to increase in the future?
3. How is polar satellite data used in weather forecasting? How will the instruments on the National Polar-orbiting Operational Environmental Satellite System (NPOESS) improve our ability to provide three to seven day weather forecasts and to predict severe weather events?
4. What major industries rely on three to seven day weather forecasts for business decisions?
5. If there was a loss of polar satellite coverage for 21 months, what effect would that have on industries that use weather forecasts from polar-satellite data? What effect would it have on climate data records?

Appendix A – Schematic of Polar Satellite Coverage Now and in the Future. EUMETSAT/METOP refers to European satellites.



Appendix B – Total NPOESS Life-Cycle Cost Estimate Changes from FY03 to FY04. Numbers in millions of dollars;
 * indicates actual appropriation; all other numbers are anticipated Administration request levels; n/a: not available at this time.

Date of Estimate	FY01 & prior	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	Total
July 2002 agency planning documents	547*	308*	474	613	637	704	636	502	523	366	273	171	257	176	266	175	173	138	6482
March 2003 President's budget request plus FY03 supplemental	547*	308*	461*	543	607	684	626	517	573	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6100
Difference			-13	-70	-30	-20	-10	+15	+50										-382

Appendix C – United States Polar Satellite Transition Schedule, March 2003.

Abbreviations:

FY: Fiscal Year

DMSP: Defense Meteorological Satellite Program, DOD

NPOESS: National Polar-orbiting Operational Satellite System,

NOAA and DOD

EOS-Terra, EOS-Aqua, and NPP: NASA satellites

POES: Polar-orbiting Operational Satellite System, NOAA

